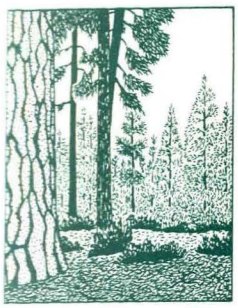

FOREST RESEARCH NOTES

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
KEITH ARNOLD, DIRECTOR

U.S. DEPARTMENT OF AGIRCULTURE – FOREST SERVICE

INTERMOUNTAIN STATION
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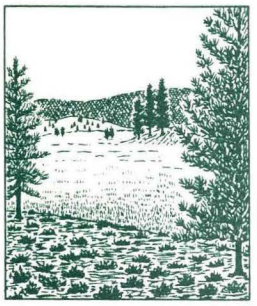

No. 132

November 1957

PAMPASGRASS IN THE SIERRA FOOTHILLS

Lisle R. Green[1/] and Donald R. Cornelius[2/]

Pampasgrass (Cortaderia selloana) is a large coarse-leaved perennial grass that grows in big bunches. It is native to the plains and open slopes of Brazil, Argentina, and Chile (3). Because of its large, feathery, plume-like panicles it has long been popular as an ornamental plant in southern California. Under garden conditions the clumps of mostly basal leaves may reach a basal diameter of 4 feet or more and a height of 6 or 8 feet; the flowering stalks or plumes will rise higher than this. Recent tests indicate it may have value as a range plant in some localities.

Pampasgrass has been used for grazing in New Zealand, principally by cattle in winter (4, 1), where yields up to 50 tons of green herbage per acre have been obtained (7). It has also been considered for winter grazing in Britain (2). Recent work in New Zealand (5) has shown that cutting pampasgrass twice yearly at 9 inches above the ground weakened the plants. Summer cutting gave a higher yield than winter or spring cutting. Grazing once a year combined high yield with good plant growth. The heaviest yield was obtained from cutting in alternate years, but the quality of the herbage was low. Crude protein was 9.6 percent for 4-months leaf growth and ranged down to 5.5 percent for 24-months leaf growth.

The U.S. Department of Agriculture, Soil Conservation Service, on the basis of tests in Ventura and Los Angeles Counties, reported pampasgrass to be a palatable drought-resistant plant which produced summertime green feed at the rate of one animal-unit month of grazing per acre (6).

It was considered advisable to test the plant at the San Joaquin Experimental Range located in Madera County in the Sierra foothills. This paper reports results of the pampasgrass test.

1/ Formerly range conservationist, California Forest and Range Experiment Station; present address: California State Polytechnic College, San Luis Obispo, California.

2/ Range conservationist, Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture, formerly on the staff of the California Forest and Range Experiment Station.

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METHODS

Two thousand seedling pampasgrass plants were provided by the Nursery Division of the Soil Conservation Service in late winter 1950. A planting site was selected on Visalia sandy loam, an alluvial soil of granitic origin. This moderately deep soil offered the most favorable conditions for growth of pampasgrass to be found on the San Joaquin Experimental Range. Rows were planted 8 feet apart to provide ample growing space for the pampasgrass plants and to permit use of a small tractor with attachments between the rows. Weed growth from past years and green annual plant growth were scraped from the rows with a tractor and scraper.

Planting was done by a two-man crew on February 7, 1950. One man opened spade holes at 4-foot intervals along the row; the second carried plants, inserted one in each hole and firmed the soil about each plant. Planting was at a rate of 100 plants per man-hour. There was one plant for approximately each 32 square feet of land area.

Competition from spring- and summer-growing plants was removed the first year by disking between the pampasgrass rows. In the second year a dense growth of annuals was allowed to remain. On December 12, 1951 the space between the rows was redisked and seeded to a mixture of Hardinggrass (Phalaris tuberosa stenoptera), smilo (Oryzopsis miliacea), bur clover (Medicago hispida), sub clover (Trifolium subterraneum), rose clover (T. hirtum), and hairy vetch (Vicia villosa). In succeeding years pampasgrass competed with a dense growth of these species.

At the time of seeding in 1951 single superphosphate at 400 pounds per acre was broadcast on the area. The fertilization was repeated September 27, 1953, with 375 pounds of single superphosphate per acre.

The pampasgrass was planted on approximately 1-1/2 acres within a 10.9 acre field. When cattle were permitted in this field they had access to the entire area.

GRAZING VALUE

The pampasgrass was first exposed to grazing September 28, 1951 near the end of the second growing season. Five cows had access to the green pampasgrass, ~~and~~ dry annuals, ~~including~~ Hardinggrass, nodding stipa (Stipa cernua), and purple stipa (S. pulchra).

Pampasgrass was grazed lightly throughout the 32-day period. Cattle first ate the plumes. After that at least some of the cows each day grazed the pampasgrass for short periods, then moved on to other species. Pampasgrass was about 3-feet average height at start of grazing and 15 to 18 inches when cows were removed. Annuals had supplied the bulk of the grazing and Hardinggrass had been moderately grazed.

The next grazing started in September 1953. By early November some small pampasgrass plants had been grazed to stubby clumps, while many larger plants were lightly used. Annual grasses, bur clover, hairy vetch, stipa, and Hardinggrass had all been much more heavily utilized than the pampasgrass. At the end of November the chief change in the grazing pattern was heavier use of the pampasgrass, but it was not judged "moderately grazed" until February.

In most years since then a few cows have been in the field from about July 1 so that the pasture reaches an overall moderate use by October or November. At this time the pampasgrass has always been grazed back to the old stubble at about 18 or 20 inches in height, but in no case have cattle concentrated on pampasgrass so that it reached proper use before the bulk of other vegetation in the field.

During the green-forage season, February through April, pampasgrass has interested the cattle somewhat less than during the period when all other range vegetation was dry, but some grazing has occurred. Twenty steers in the pasture during most of June 1952, grazed small pampasgrass moderately or closer, but larger plants were grazed on the light side of moderate. Between January 27 and March 24, 1953, pampasgrass was lightly grazed while most annual grasses and legumes, Hardinggrass, and purple stipa were closely grazed. Three cows in the pasture during the winter of 1953-54 had grazed the pampasgrass moderately and the annuals closely by mid-February.

GROWTH AND SURVIVAL

Mortality was about two-thirds during the first 2 years. Since that time plant numbers have remained almost constant; only a few died each year (table 1).

The chief cause of death appeared to be insufficient moisture for summer growth. Plants stopped growing, the lowermost leaves turned yellow, and the yellowing gradually spread over the entire plant. The process took place most severely and frequently on soil farthest from an intermittent creek channel and on somewhat higher elevation.

Gophers were responsible for loss of some plants. In September 1951, 198 dead plants were standing in place. Of these, 23 had been killed by gophers, which ate out the crown at about ground level. A number of other plants had been damaged by gophers eating out only part of the crown.

Those plants which survived the first summer averaged about 20 inches in height, 2 inches in basal diameter, and 20 or more leaves. Thirty-four plumes were produced by the approximately 1,500 plants. After 2 years, plants were typically 30 to 40 inches tall with a basal diameter of 6 inches. The pampasgrass was grazed by cattle at the end of the second growing season, in September 1952.

Table 1.--Survival of pampasgrass plants, San Joaquin Experimental Range, 1950-57

Date of observation	Percentage of original 2,000 plants: Apparently dying	Dead or missing	Apparently established
	(%)	(%)	(%)
November 1950	1/	22	78
September 1951	13	55	32
August 1952	1/	71.5	28.5
September 1953	0.7	70	29.3
July 1957	0.6	73.4	26

1/ Not recorded.

Eight plants were selected for measuring and clipping (table 2) at the end of the 1953 growing season. Two were typical small plants, 2 approached average size, 3 were average or larger than average, and 1 definitely larger but not the largest that could have been selected. These plants, selected as representative of the field, averaged 5 feet high, not including flower stalks, and had a maximum spread of 5.3 feet at about 4 feet above ground level (fig. 1). Basal diameter was 1.6 feet. To get an estimate of production, the 8 plants were clipped to simulate moderate use. All leaves were clipped back until "stumpy" plants about 20 to 24 inches in height were left. Production per plant varied from 0.88 to 1.75 pounds, air dry weight (table 2) with an average production of 1.13 pounds. Air dry weight was 50.3 percent of the green weight. Assuming a solid stand of pampasgrass spaced as these had been planted, an acre would support 1,360 plants and produce 1,537 pounds of grazable pampasgrass herbage.

Regrowth after grazing was fairly rapid each spring. Cattle were removed from the pasture February 13, 1956. An observation on April 3 recorded leaf extension of 12 to 14 inches beyond the old leaf stubble. Between February 21, 1957, and mid-March, leaves elongated about 10 inches.

CONCLUSIONS

In California's annual-type foothill ranges, any range plant which stays green in the summer and fall, such as pampasgrass, is of considerable value. There is the possibility of higher protein and vitamin A in the livestock diet, and greater livestock gains. Balanced against this must be the cost of establishment and maintenance and the value of other feed which may be replaced.

Table 2.--Plant size and herbage production

Size	Number plants sampled	Average air dry weight	Average dimensions: Basal diameter	Widest spread	Height
		Pounds	Feet	Feet	Feet
Small	2	0.88	1.2	4.2	4.7
Medium	2	0.95	1.5	5.2	5.2
Large	3	1.22	2.0	6.2	5.0
Large	1	1.75	1.6	4.6	5.2
Weighted average		1.13	1.6	5.3	5.0

Clean cultivation has been recommended in pampasgrass culture (6). This practice saves all available soil moisture and nutrients for the pampasgrass and results in greatest survival and growth. Such treatment was not given in the test reported here after the first year because it was felt that most ranchers would not clean cultivate and because the favorable site on which the pampasgrass was planted could produce two tons or more of annual grass and legume herbage per acre after fertilization. This production of herbage by native and introduced annual plants is greater than could be expected from the pampasgrass.

It appears that the remaining 530 plants in the Experimental Range planting will survive in competition with the heavy growth of annuals.

The single superphosphate fertilizer did not appear to benefit the pampasgrass, although shallow-rooted annual ryegrass (Lolium multiflorum) and annual legumes showed good response. A nitrogenous fertilizer, applied during the fall or winter when moisture was available, might greatly stimulate growth of pampasgrass.

To remain green in the summer and fall, pampasgrass must have available summer moisture. On range land, this usually means a deep, medium- to fine-textured soil which stores moisture below the evaporation zone on cultivated areas and below the root zone of annual plants on other areas. Such sites are not common in the Sierra granitic soil belt, but the deep, fine-textured soils in the Coastal Ranges and other sections of the state at low elevations should present many opportunities for pampasgrass.

Figure 1.--Four-year-old pampasgrass plants competed well with heavy stand of annual legumes and grass. Plants were grazed in their second and third growing seasons.

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